

In The Claims

1-73 (canceled).

74. (currently amended) A method for removing NO_x and SO_x contaminants from a gaseous stream comprising the steps of:

(A) in a sorbing period, passing a lean gaseous stream within a sorbing temperature range through a layered catalyst composite comprising a first layer and a second layer:

(a) the first layer comprising a first support, a NO_x sorbent component, and a first platinum component; and

(b) the second layer comprising a second support and a SO_x sorbent component ~~having a free energy of formation from about 0 to about 90Kcal/mole at 350°C.~~ selected from the group consisting of MgAl₂O₄, MgO, MnO, MnO₂, and Li₂O, wherein the SO_x sorbent component has a higher free energy of formation at 350°C than the NO_x sorbent component;

to sorb at least some of the SO_x contaminants into the second layer and thereby provide a SO_x depleted gaseous stream exiting the second layer and entering the first layer, wherein the first layer sorbs and abates the NO_x in the gaseous stream; and

(B) in a desorbing period, converting the lean oxidative stream to a rich reductive gaseous stream and raising the temperature of the gaseous stream to within a desorbing temperature range to thereby reduce and desorb at least some of the SO_x contaminants from the second layer and thereby provide a SO_x enriched gaseous stream exiting the second layer.

75. (original) The method as recited in claim 74, wherein the first and second supports are the same or different and are compounds selected from the group consisting of silica, alumina, and titania compounds.

76-81 (canceled).

82. (currently amended) The method as recited in claim 74 ~~81~~, wherein the SO_x sorbent component is MgO or Li₂O.

83-92 (canceled).

93. (original) The method as recited in claim 74, wherein the second layer comprises from about 0.03g/in³ to about 2.4g/in³ of the SO_x sorbent component.

94. (original) The method as recited in claim 93, wherein the second layer comprises from about 0.3g/in³ to about 1.8g/in³ of the SO_x sorbent component.

95. (currently amended) The method as recited in claim 74, wherein the first ~~layer-further-comprises-a~~ NO_x sorbent component is selected from the group consisting of alkaline earth metal components, alkali metal components, and rare earth metal components.

96. (original) The method as recited in claim 95, wherein the NO_x sorbent component is selected from the group consisting of oxides of calcium, strontium, and barium, oxides of potassium, sodium, lithium, and cesium, and oxides of cerium, lanthanum, praseodymium, and neodymium.

97. (original) The method as recited in claim 96, wherein the NO_x sorbent component is selected from the group consisting of oxides of calcium, strontium, and barium.

98. (original) The method as recited in claim 96, wherein the NO_x sorbent component is selected from the group consisting of oxides of potassium, sodium, lithium, and cesium.

99. (original) The method as recited in claim 96, wherein the NO_x sorbent component is selected from the group consisting of oxides of cerium, lanthanum, praseodymium, and neodymium.

100. (original) The method as recited in claim 96, wherein the NO_x sorbent component is at least one alkaline earth metal component and at least one rare earth metal component selected from the group consisting of lanthanum and neodymium.

101. (original) The method as recited in claim 74, wherein at least one of the first or second layers further comprises a zirconium component.

102. (currently amended) A method for removing NO_x and SO_x contaminants from a gaseous stream comprising the steps of:

(A) in a sorbing period, passing a lean gaseous stream within a sorbing temperature range through an axial layered catalyst composite comprising an upstream section and a downstream section:

(1) the downstream section comprising:

(a) a downstream substrate; and

(b) a first layer on the downstream substrate, the first layer comprising a first support, a NOx sorbent component, and a first platinum component;

(2) the upstream section comprising:

(a) an upstream substrate; and

(b) a second layer on the upstream substrate, the second layer comprising a second support and a SOx sorbent component ~~having a free energy of formation from about 0 to about -90 Kcal/mole at 350°C~~ selected from the group consisting of $MgAl_2O_4$, MgO , MnO , MnO_2 , and Li_2O , wherein the SOx sorbent component has a higher free energy of formation at 350°C than the NOx sorbent component;

to sorb at least some of the SOx contaminants into the upstream section and thereby provide a SOx depleted gaseous stream exiting the upstream section and entering the downstream section, wherein the downstream section sorbs and abates the NOx in the gaseous stream; and

(B) in a desorbing period, converting the lean oxidative gaseous stream to a rich reductive gaseous stream and raising the temperature of the gaseous stream to within a desorbing temperature range to thereby reduce and desorb at least some of the SOx contaminants from the upstream section and thereby provide a SOx enriched gaseous stream exiting the upstream section.

103. (currently amended) The method as recited in claim 102, wherein

(1) the first layer on the downstream substrate ~~further~~ comprises a NOx sorbent component selected from the group consisting of cesium components, potassium components, and cerium components; and

(2) the second layer on the upstream substrate comprises a SOx sorbent component which is $MgAl_2O_4$; and

further comprising a first midstream section located between the upstream section and the downstream section:

(3) the first midstream section comprising:

(a) a first midstream substrate; and

(b) a third layer on the first midstream substrate, the third layer comprising:

(i) a third support; and

(ii) a third SO_x sorbent component which is selected from the group consisting of BaO and MgO;

to sorb at least some of the SO_x contaminants into the first midstream section and thereby provide a SO_x depleted gaseous stream exiting the first midstream section and entering the downstream section, wherein the downstream section sorbs and abates the NO_x in the gaseous stream; and

(B) in a desorbing period, converting the lean gaseous stream to a rich gaseous stream and raising the temperature of the gaseous stream to within a desorbing temperature range to thereby reduce and desorb at least some of the SO_x contaminants from the first midstream section and thereby provide a SO_x enriched gaseous stream exiting the first midstream section.

104. (original) A method for removing NO_x and SO_x contaminants from a gaseous stream comprising the steps of:

(A) in a sorbing period, passing a lean gaseous stream within a sorbing temperature range through a radial layered catalyst composite comprising a bottom layer, a first middle layer, and a top layer:

(a) the bottom layer comprising: (i) a first support;

(ii) a first platinum component;

(iii) a first NO_x sorbent component selected from the group consisting of cesium components, potassium components, and cerium components; and

(b) the first middle layer comprising:

(i) a second support;

(ii) a second SO_x sorbent component which is selected from the group consisting of BaO and MgO; and

(c) the top layer comprising:

(i) a third support;

(ii) a third SO_x sorbent component which is MgAl₂O₄;

to sorb at least some of the SO_x contaminants into the top and first middle layers and thereby provide a SO_x depleted gaseous stream exiting the top and first middle layers and entering the bottom layer, wherein the bottom layer sorbs and abates the NO_x in the gaseous stream; and

(B) in a desorbing period, converting the lean gaseous stream to a rich gaseous stream and raising the temperature of the gaseous stream to within a desorbing temperature range to thereby reduce and desorb at least some of the SO_x contaminants from the top and first middle layers and thereby provide a SO_x enriched gaseous stream exiting the top and first middle layers.

105. (original) The method as recited in claim 104, wherein

(3) the first middle layer comprises a SO_x sorbent component which is MgO; and further comprising a second middle layer located between the bottom layer and the first middle layer:

(d) the second middle layer comprising:

(i) a fourth support; and